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United States Department of Agriculture | Forest Service | Stanislaus National Forest
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Reply To: 3400 Date: January 29, 1992

Subject: Deep Tilling (C92-1)

To: Rob Griffith, Groveland RD

The following addresses some of your concerns about deep tilling and damage to root systems. This information is not based on experimental data but on field observations, insect and disease ecology and behavior, and a general understanding of root damage to trees.

Under normal circumstances, most trees can probably lose up to one-third of their roots without dying from the damage although such damage could temporarily increase, to some extent, chances of bark and/or engraver beetle attack. However, when the damage occurs while a tree is already under stress, such as from drought, the likelihood of subsequent bark and/or engraver beetle problems is greatly increased. There have been a few reports in R5 of bark/engraver beetle-related mortality occurring in pine plantations soon after they were thinned during the current drought. We have not established a direct link between this mortality and the thinning operations (there are many variables to consider), but, in general, we do not encourage activities in stressed stands that are disruptive to the site.

Deep tilling will probably not create root disease problems unless root disease is already on the site. In general, our root rot fungi do not live freely in the soil waiting to invade injured roots. But deep tilling through root disease centers could spread underground inoculum and increase problems. Stands where root disease is known to occur are not good candidates for deep tilling. This is not to suggest that that all areas considered for tilling be surveyed fir root disease first. Silviculturists are already aware of many stands that have a history of root rot problems; hopefully this information is documented on stand record cards.

Staying outside the crown drip line of trees is a reasonable guideline, especially during a drought, but it seems that this would not allow tilling in narrow skid trails and within stands/plantations growing on compacted soils. An additional, if not bigger concern, is with logging damage to trees during harvest operations. Many trees that are wounded, particularly true fir, may develop root, butt, or heart rot. It may be, that far more long-term damage or loss to trees originates during harvest that from deep tilling. In addition to concerns about deep tilling, there should be more emphasis put on minimizing skid trails and enforcing logging practices that reduce basal injury to leave trees.

Certainly, deep tilling of compacted soils has a number of potential benefits, including helping to prevent bark/engraver beetle problems because of increased growth, health and vigor of the trees. At the same time, there are a number of unanswered questions, and one way to obtain the needed information would be to

establish monitoring sites to evaluate the impacts, positive and negative, of deep tilling. From a pest management standpoint, trees that are going to die directly because of root damage and/or subsequent bark/engraver beetle attack, would probably die within a 3-year period.

Please give us a call if you have any questions or would like to discuss this in more detail.

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Plant Pathologist

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